

Science and Prosperity

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## EDUCATIONAL DISCUSSION

### SCIENCE AND PROSPERITY<sup>1</sup>

It is not an easy thing to introduce control and guidance. Individuals like to have independence; business organizations resist control; labor groups do not take kindly to the imposition of regulation from without; yet we must realize that society, like a gas, is chaotic and powerless if its human molecules, like gas molecules, have complete independence. Civilization consists in giving up a certain amount of individual freedom and irresponsibility in favor of group responsibilities and relationships which are socially more beneficial. I take it that our nation is now in the throes of becoming a little more civilized. Perhaps since this ascent from chaos is dependent on the use of intelligence, it is not going too far to say that the agonies of the past and present months are the natural accompaniments of a national effort at constructive thinking—said by psychologists to be a rare and difficult process even in individuals. . . .

We see the experimental scientific method in the President's realization that much of what is done is of the nature of social experiment in which some features will be found to be unsuccessful and will be dropped and the problem will be tackled in another way, whereas other features will have proved to be successful and will be continued and developed further. Every scientist knows that this is the way of progress if wisely carried out. He also knows that some experiments inevitably will fail, for if the successful outcome could be predicted with certainty from the beginning, they would not be experiments at all and would add nothing to our present knowledge or development.

"Letting nature take her course" was listed above as one of the paths to chaos. Yet there is a very fundamental truth in the minds of some people who express their economic philosophy in this phrase, namely, that experimenting or maneuvering, to be successful, must be directed to take advantage of natural laws and not to run counter to them. The achievements of science come by the intelligent, skilful utilization of established laws of science. Similarly, experiments in human affairs will be successful if they are planned in accordance with, and not contrary to, basic social laws. If, as is unfortunately so often the case, we do not yet know what these laws are, then the "trial and error" method is the only recourse. The success of this method depends on a combination of knowledge, judgment, skill, and luck. The present experiments in social adjustment lie somewhere within the boundaries of this paragraph.

<sup>1</sup> Address before the American Association for the Advancement of Science, in Berkeley, June 21, 1934.

Favorable to the success of these new social experiments is the fact that the people have had such a rude shock as to have awakened them from their complacent acceptance of the old order, which was suited to the simpler life and undeveloped natural resources of our expanding pioneer days, but which broke down under the growing complication and competition which necessarily followed modern technical progress and the final complete occupancy of the country. The people generally realize that something was wrong, and are in a mood to support well-directed efforts toward fundamental improvements. Opposed to the experiments may be those who personally suffer in the readjustments, or who do not trust the intelligence or motives of the present experimenters, or who are chiefly impressed with the unsuccessful rather than the successful experiments, or who would await more recovery before making bold experiments, or who are just naturally so conservative as to deplore departure from the "good old times." To these latter ones, however, I would point out that the old régime was not good, as proven by its disastrous debacle, and that a return to it would be as silly as for a scientist to repeat an experiment which proved unsuccessful. . . .

When the Egyptian developed a mechanical water wheel to lift water from the Nile to irrigate his fields, he did not complain about technological unemployment because the water wheel had relieved him of the necessity of lifting the water by hand; he used his new device to increase his crops and his spare time and profits to build a better home and to devote himself to more cultural pursuits than carrying water. So it is all through the field of engineering, whether it be civil or mechanical, or the newer types of electrical, chemical, automotive, aeronautical, refrigeration, agricultural, or mining engineering. All these have given man comfort, power, and opportunity. Just as old civilizations were limited by their tools of stone or bronze and therefore described as the stone age or the bronze age, so our civilization is epitomized by our progress in the engineering arts. These are prepared to advance as never before if given opportunity. It is inconceivable that their advance should not be encouraged unless, faint-hearted or shortsighted, we wish our civilization to stagnate or go backward.

In thus emphasizing the importance of science and engineering to civilization I am not unmindful of the fact that civilization should not be measured by its material features and I realize that the chief end of man is not material productive power. But I am mindful of the fact that these material things create a possibility for doing and enjoying the finer things of life. . . .

Scientific work in this country is supported chiefly by four agencies—

the government, the universities, industry, and private philanthropy. . . .

Granting that the national welfare demands increasingly effective scientific work, the practical question is, "How can this work be supported?" The increasing control of business by government plus the tendency toward a more uniform distribution of wealth will probably reduce the magnitude of those large private bequests and altruistic foundations which have been so peculiarly the backbone of American enterprise in science and other fields. The general burden of taxation and the limited interests and responsibilities of individual states make it unlikely that the state governments will shoulder the primary responsibility of supporting scientific work. The problem is essentially national in scope; the public is the ultimate beneficiary, gaining or losing according to the degree of success of the work. Should not the public, therefore, contribute at least a large part of the necessary financial backing? Such public support of course means support through the Federal Government, ultimately through taxation. I further believe that, if this were done and wisely executed, it would prove to be in the front rank among governmental undertakings in the ultimate beneficial returns to the public per dollar expended.

Of equal importance to the securing of funds is the problem of their efficient administration. . . .

I believe that the best method for administering funds for research is that which has been developed over a long period of experimentation and training through the great foundations, such as the Rockefeller Foundation and the Carnegie Corporation. They have been experimenting to find the most productive ways of administering funds for research. As a result they have trained large numbers of scientists through service on boards and committees, who have studied the needs and opportunities throughout the country with a minimum of overhead expense and a maximum of results. If large funds should become available for research this experience could be effectively used. These considerations would point to the National Academy of Sciences and the National Research Council as the natural advisory bodies in any large program of public expenditure for science. These bodies have status in the government through their charters and by executive orders, and they include representation from all important scientific and engineering societies. They have had more experience than any other similar groups in the country in the administration of funds for research.

In conclusion, I must confess to considerable doubt as to the wisdom of advocating federal support of scientific research, not because of any doubt as to its value or logic, but because of insidious dangers which are perhaps too obvious to require elaboration. If government financial

support should carry with it government control of research programs or research workers, or if it should lead to political influence or lobbying for the distribution of funds, or if any consideration should dictate the administration of funds other than the inherent worth of a project or the capabilities of a scientist, or if the funds should fluctuate considerably in amount with the political fortunes of an administration or the varying ideas of Congress, then government support would probably do more harm than good, for large support by government would tend to discourage the support by private philanthropy which has been the backbone of our scientific progress in the past and which will doubtless continue unless discouraged.

On the other hand, if government support of science were undertaken on an adequate scale and administered with the skill and experience that have already been developed in the handling of minor funds for science, such a program of federal support would certainly be a sound national investment, would be an uplifting intellectual and social influence, and might well mean the difference between prosperity and economic catastrophe at no very distant date.

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#### THE SMALL COLLEGE AND LIBERAL LEARNING<sup>1</sup>

. . . It is nearly forty years since the late President Harper preached the doctrine of the junior and the senior colleges as a solution to the problem, and junior colleges now dot the national map. But the results have not been sufficiently impressive to lead any well-established institution which could afford to carry on effectively its four-year program to relinquish it for this new status, and the correlative senior college has scarcely appeared at all. Brave devotion has gone into the upbuilding of the junior colleges, and one thinks of many instances of solid competence in their faculties, but the institution has not caught the imagination of the country or attracted large endowments. Superimposed upon the secondary school it tends too much to share its spirit; it tends to encourage the prolongation of infancy, which thoughtful observers have long since recognized as a national foible, if not a national disgrace. When standing by itself it marks one more break in the stream of education and finds its best justification, so far, as a convenient stopping place for mediocrity. The reorganization of our education upon the *lycée* or *gymnasium* plan has not succeeded far enough at present to menace the existence of the historic college. . . .

<sup>1</sup> Inaugural address at the installation of the twelfth president of Union College, Schenectady, New York, October 12, 1934.